Pre-Algebra & Geometry

Self-Study Workbook · Print Edition

Part 1 — Pre-Algebra

Q1. [Order of Operations]

Evaluate: 3 + 4 x 2^2 - 6 / 3

■ *Memory Key: PEMDAS: Parentheses > Exponents > Multiply/Divide > Add/Subtract*

A) 17
B) 15
C) 19
D) 13

Answer: A) 17

Explanation: 2^2=4, 4x4=16, 6/3=2, then 3+16-2 = 17

Q2. [One-Step Equations]

Solve for x: x - 9 = 14

■ *Memory Key: INVERSE: Add 9 to both sides (opposite operation).*

A) x=5
B) x=23
C) x=24
D) x=126

Answer: B) x = 23

Explanation: x - 9 + 9 = 14 + 9 => x = 23

Q3. [Two-Step Equations]

Solve for n: 5n + 3 = 28

■ *Memory Key: SADMEP: Undo addition first, then division (reverse PEMDAS).*

A) n=4
B) n=5
C) n=6
D) n=7

Answer: B) n = 5

Explanation: 5n = 28-3 = 25, then n = 25/5 = 5

Q4. [Negative Numbers]

Which expression has the GREATEST value?

A) -3 + (-8) B) -12 - (-5) C) (-4) x (-3) D) -20 / 4

■ *Memory Key: SAME signs = positive product/sum. DIFFERENT signs = negative.*

A) -11
B) -7
C) +12
D) -5

Answer: C) (+12) because (-4) x (-3) = +12

Explanation: Negative x Negative = Positive. All other options are negative.

Q5. [Proportions]

A car travels 150 miles in 3 hours. At the same rate, how far in 5 hours?

■ *Memory Key: UNIT RATE first: find miles per 1 hour, then scale up.*

A) 200 miles
B) 250 miles
C) 300 miles
D) 225 miles

Answer: B) 250 miles

Explanation: 150/3 = 50 mph (unit rate). 50 x 5 = 250 miles

Q6. [Percentages]

A shirt costs $40. It is 25% off. What is the SALE PRICE?

■ *Memory Key: OFF is not the price! Discount = 25% of $40. Sale price = original - discount.*

A) $10
B) $25
C) $30
D) $35

Answer: C) $30

Explanation: Discount = 0.25 x 40 = $10. Sale price = $40 - $10 = $30

Q7. [Distributive Property]

Simplify: 3(2x - 4) + 5x

■ *Memory Key: DISTRIBUTE FIRST: multiply outside by every term inside, then combine like terms.*

A) 10x-4
B) 11x-12
C) 11x+12
D) 6x-4

Answer: B) 11x - 12

Explanation: 3(2x) + 3(-4) + 5x = 6x - 12 + 5x = 11x - 12

Q8. [Inequalities]

Solve: -4x > 20

■ *Memory Key: FLIP the inequality sign when dividing/multiplying by a NEGATIVE number!*

A) x > -5
B) x < -5
C) x > 5
D) x < 5

Answer: B) x < -5

Explanation: Divide both sides by -4 AND FLIP: x < 20/(-4) = -5

Q9. [Ratios & Rates]

A recipe: 2 cups flour for every 3 cups sugar. If 8 cups flour, how many cups sugar?

■ *Memory Key: SCALE FACTOR: 8 / 2 = 4. Apply same factor to the other quantity.*

A) 9 cups
B) 10 cups
C) 12 cups
D) 6 cups

Answer: C) 12 cups

Explanation: Scale factor = 8/2 = 4. Sugar = 3 x 4 = 12 cups

Q10. [Exponent Rules]

Simplify: x^3 * x^5

■ *Memory Key: SAME BASE + ADD exponents. a^m x a^n = a^(m+n)*

A) x^15
B) x^2
C) x^8
D) 2x^8

Answer: C) x^8

Explanation: Same base, add exponents: x^(3+5) = x^8 (NOT 3x5=15)

Part 2 — Geometry

Q1. [Area of Triangle]

A triangle has a base of 10 cm and a height of 6 cm. What is its area?

■ *Memory Key: HALF of rectangle: Area = (1/2) x base x height*

A) 30 cm^2
B) 60 cm^2
C) 15 cm^2
D) 20 cm^2

Answer: A) 30 cm^2

Explanation: A = 1/2 x 10 x 6 = 30. (60 is the rectangle — forgetting the 1/2 is the #1 mistake!)

Q2. [Pythagorean Theorem]

A right triangle has legs of 6 cm and 8 cm. Find the hypotenuse.

■ *Memory Key: a^2 + b^2 = c^2 (c is always the hypotenuse — the longest side)*

A) 10 cm
B) 12 cm
C) 14 cm
D) 7 cm

Answer: A) 10 cm

Explanation: 6^2 + 8^2 = 36 + 64 = 100. sqrt(100) = 10 (Classic 3-4-5 x 2)

Q3. [Circle Area vs Circumference]

A circle has radius = 7 cm. Find the AREA. (pi = 3.14)

■ *Memory Key: Area = pi x r^2 (SQUARED!). Circumference = 2 x pi x r. Don't swap them!*

A) 43.96 cm^2
B) 153.86 cm^2
C) 21.98 cm^2
D) 78.5 cm^2

Answer: B) 153.86 cm^2

Explanation: A = pi x 7^2 = 3.14 x 49 = 153.86 (43.96 is the circumference!)

Q4. [Angle Relationships]

Two supplementary angles: one measures 67 degrees. Find the other.

■ *Memory Key: S for Supplementary = 180 (Straight line). C for Complementary = 90 (Corner).*

A) 23 deg
B) 123 deg
C) 113 deg
D) 293 deg

Answer: C) 113 degrees

Explanation: Supplementary = 180 deg. Other angle = 180 - 67 = 113 deg

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Q5. [Perimeter of Rectangle]

A rectangle: length = 12 m, width = 5 m. Find the perimeter.

■ *Memory Key: P = 2l + 2w (4 sides total: 2 lengths + 2 widths). Don't just add l + w!*

A) 17 m
B) 60 m
C) 34 m
D) 24 m

Answer: C) 34 m

Explanation: P = 2(12) + 2(5) = 24 + 10 = 34 m (17 is only 2 sides — common mistake!)

Q6. [Volume of Rectangular Prism]

A box: 8 cm long, 5 cm wide, 3 cm tall. Find the volume.

■ *Memory Key: V = L x W x H (all 3 dimensions — it fills 3D space!)*

A) 40 cm^3
B) 79 cm^3
C) 120 cm^3
D) 64 cm^3

Answer: C) 120 cm^3

Explanation: V = 8 x 5 x 3 = 120 cm^3

Q7. [Triangle Interior Angles]

A triangle has angles of 55 deg and 72 deg. Find the third angle.

■ *Memory Key: TRIANGLE = 180 deg always. Subtract the two known angles.*

A) 53 deg
B) 63 deg
C) 73 deg
D) 127 deg

Answer: A) 53 degrees

Explanation: Third angle = 180 - 55 - 72 = 53 degrees

Q8. [Coordinate Plane]

Point P(-3, 5) — which quadrant?

■ *Memory Key: QI(+,+) QII(-,+) QIII(-,-) QIV(+,-) Go counter-clockwise from top-right.*

A) Quadrant I
B) Quadrant II
C) Quadrant III
D) Quadrant IV

Answer: B) Quadrant II

Explanation: x=-3 (left of y-axis), y=+5 (above x-axis). Left + Above = Quadrant II

Q9. [Similar Figures]

Two similar rectangles: sides 4 cm and 6 cm. Smaller area = 20 cm^2. Larger area?

■ *Memory Key: AREA scale = (side scale)^2. If sides scale by k, area scales by k squared!*

A) 30 cm^2
B) 45 cm^2
C) 60 cm^2
D) 80 cm^2

Answer: B) 45 cm^2

Explanation: Side scale = 6/4 = 1.5. Area scale = 1.5^2 = 2.25. Area = 20 x 2.25 = 45

Q10. [Parallel Lines & Transversals]

Two parallel lines cut by a transversal. Alternate interior angle = 65 deg. Other alternate interior angle = ?

■ *Memory Key: ALTERNATE interior angles are EQUAL. CO-INTERIOR (same-side) add to 180 deg.*

A) 115 deg
B) 65 deg
C) 25 deg
D) 130 deg

Answer: B) 65 degrees

Explanation: Alternate interior angles are congruent. So the other angle is also 65 deg.

Answers and explanations are shown below each question for self-checking.